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AUTHOR Gross, Leon J.; Farr, S. David
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ABSTRACT

The perceived similarity of Holland's vocational personality stereotypes was examined using the techniques of nonmetric multidimensional scaling. Three job titles (JTs) were selected for each of Holland's stereotypes. These 18 JTs were then randomly paired. The resulting 153 pairs comprised an inventory which was administered to all students in a masters level course in educational psychology. The subjects were directed to indicate on a six-point scale how similar or dissimilar the jobs represented by each JT pair were perceived. Based on stress values, the results indicated that the JTs were seen as clustering in, at most, four dimensions. (Aurhor/HV)

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A MULTIDIMENSIONAL SCALING ANALYSIS OF HOLLAND'S VOCATIONAL PERSONALITY STEREOTYPES*

Leon J. Gross

University of Illinois Medical Center

S. David Farr

State University of New York at Buffalo

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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Holland's theory (1959, 1966) of vocational choice has been the subject of several empirical studies involving student self-ratings. Osipow, Ashby, & Wall (1966) examined the relationship between occupational choice and self-ratings based on the descriptions of Holland's stereotypes, with a sample composed of college freshmen with varying levels of commitment to a particular academic major. The authors obtained significant relationships between four personality types and occupational choice among students committed to their respective major. In a subsequent retest of Holland's theory using self-ratings (Gross & Gaier, 1974), male college seniors were requested to select the stereotype which they felt best described them. Significant relationships were obtained between four personality types and occupational choice and between four personality types and academic major, although the significant personality types were not identical for both relationships.

Both of these studies demonstrated the power of Holland's theory in self-perception situations in which individuals select the personality type which they feel best describes them. These results raise the question of whether Holland's theory could be further examined by using students' self-perceptions of similarity and dissimilarity among representative job titles (JTs) and determining whether the dimensionality and groupings of these perceptions

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coincide with Holland's model.

Reeb (1959) conducted a study attempting to identify the occupational groupings that result from sets of similarity judgments. He selected 15 JTs and directed a sample of 25 British Youth Employment Officers to indicate how similar they perceived the jobs to be, utilizing the method of paired comparisons. A 7-point rating scale was provided, composed of three grades of both similarity and dissimilarity, and one neutral midpoint. A multidimensional scaling analysis of the means for each pair yielded two dimensions which were regarded as being significant. The first component was identified as representing a craft vs. clerical dimension; the second as corresponding to a general level dimension. It must be noted here that Reeb's study preceded Holland's work and therefore, neither sampled JTs representing his six stereotypes, nor attempted to ascertain whether an analysis of Ss' perceptions of JTs would reveal dimensions that parallel those of Holland. His study, however, did clearly indicate that multidimensional scaling is a useful technique in interpreting how individuals perceive the world of work. The purpose of the present study was to apply a similar multidimensional scaling technique to paired comparisons of JTs representing Holland's stereotypes. It was expected that the obtained dimensions would be representative of several of Holland's stereotypes.

METHOD

Three JTs for each of Holland's stereotypes, which are presented in Table 1, were selected to form the JT Inventory. The 18 total JTs were then

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Insert Table 1 about here

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randomly paired and 153 pairs, representing every $\frac{n(n-1)}{2}$ combination,

comprised the Inventory. The sample consisted of all students in a masters level course in educational psychology at SUNY/Buffalo during the summer of 1975. The Ss were administered the Inventory and directed to indicate how similar or dissimilar the jobs represented by each pair of JTs were perceived. In determining the similarity or dissimilarity of each pair, the Ss were requested to think about each job as a whole, rather than any particular aspect of it or individual who is in the given occupation. A 6-point rating scale was provided, ranging from extremely dissimilar (1) to extremely similar (6). In order to force a similarity-dissimilarity decision, a neutral midpoint was not provided. Forty-five minutes were required for completion; the papers of six Ss who did not complete the Inventory were discarded. The final sample consisted of 41 Ss, which, with a maximum 6-dimensional scaling solution, would be more than adequate to meet the minimum sample size criterion of $4r + 1$, where r is the number of dimensions (Kruskal, Young, & Seery, 1973).

RESULTS

The similarity ratings for the 153 JT pairs were averaged across Ss; the obtained mean ratings served as input data for the TORSCA FORTRAN IV program for nonmetric multidimensional scaling (Young & Torgerson, 1967). Configurations were analyzed for solutions ranging from 2 through 6 dimensions. The stress values for each solution are plotted in Figure 1. Stress, in

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Insert Figure 1 about here

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effect, is a residual sum of squares expressed as a percentage. Decreasing stress values indicate that there is an increasingly greater monotonic relationship between the object dissimilarities and distances. While 0%

stress would clearly indicate a perfect goodness of fit, 5% is considered good, and 10% fair (Kruskal, 1964). The stress values in Figure 1 are 21% for r = 2, 11% for r = 3, 8% for r = 4, 5% for r = 5, and 3% for r = 6. Compelling arguments can be given in support of the 2-, 3-, and 4-dimensional solutions. With four dimensions, the percentage of stress dips below Kruskal's 10% criterion; however, the 3-dimensional solution is more compelling in that the percentage of stress is fairly low (11%) and that additional dimensions provide only slight reductions in stress. One could argue in support of the 2-dimensional solution since the sharpest elbow in the curve occurs at this point. However, the percentage of stress (21%) in this solution is too great to be considered an acceptable fit. The 5- and 6-dimensional solutions were considered unacceptable in that the reduction in stress was too small to justify expanding the dimensionality. The configurations of the JTs for the 2-, 3-, and 4-dimensional solutions are discussed below.

The structure matrix for the 2-dimensional solution is given in Table 2.

Insert Table 2 about here

The only pattern in this matrix that is consistent with Holland's model is the artistic stereotype in the first factor, represented here by writer, artist, and musician. However, it can also be seen that philosopher was perceived as being similar to the artistic JTs. A second cluster in the first factor consisted of mechanic and bank teller. This first factor could be regarded as a dimension representing creative vs. task-oriented jobs. The structure coefficients for dentist and nurse in the second factor suggest the presence of a health professions dimension. In analyzing this 2-dimensional solution, it must be kept in mind that the structure coefficients are fairly modest, which would be expected given the relatively high stress value of 21%.

The structure matrix for the 3-dimensional solution is presented in Table 3. The first factor is similar in interpretation but somewhat different

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Insert Table 3 about here

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in composition from that of the 2-dimensional solution. Again, the most salient cluster consists of the four creative jobs; however, the task-oriented cluster is now comprised of only bank teller. The second factor in this solution is also somewhat different in composition from its counterpart in the 2-dimensional solution. With the substantial structure coefficient for policeman, this factor can no longer be regarded as representing health professions but rather, representing service- or people-oriented professions. Furthermore, the negative coefficient for clerk suggests that this factor could be interpreted as representing a people-oriented vs. paperwork-oriented profile. The structure coefficients for mechanic and engineer in the third factor initially appear to be consistent with Holland's realistic stereotype; however, the negative coefficient for policeman inhibits such an interpretation. The cluster composed of mechanic and engineer could more likely be interpreted as representing applied jobs requiring spatial relations aptitude. The weaker cluster composed of policeman and salesman could be interpreted as representing outdoor occupations; however, the profile created by these clusters is not a very sensible one.

The structure matrix for the 4-dimensional solution is given in Table 4.

Insert Table 4 about here

The coefficients for the first two factors form clusters identical to the first two factors in the 3-dimensional solution. The composition of the third factor is somewhat different in that salesman cannot be considered as

clustering with policeman. This factor might now be interpreted as representing Holland's realistic stereotype in terms of jobs requiring aptitude in spatial relations vs. jobs that do not. The fourth factor does not reveal any new cluster of jobs, with lawyer having the only coefficient of modest magnitude.

DISCUSSION

The plot of stress values mentioned earlier indicated that the reduction in stress began to level off after three dimensions. The impact of this reduction is evident in the 4-dimensional solution where the fourth factor denoted a modest representation of only one job. The fifth factor in the 5-dimensional solution and sixth factor in the 6-dimensional solution similarly represented only one job, and were not presented because of the negligible decrease in stress. Since it was desirable to obtain factors that identify clusters of jobs from which one could generalize to the population of jobs, single job factors are not useful. While job clusters were identifiable in the 2-dimensional solution, the stress value for this solution was unacceptably high. In considering the tradeoff between stress and simplicity of interpretation, the 3-dimensional solution appears most acceptable. The clearest picture of the Ss' perceptions of job similarity in this solution is in terms of creativity, people-oriented, and spatial relations aptitude. The job clusters which provided a profile within each factor cannot be interpreted with as much confidence because (1) only one job was represented (e.g., bank teller in factor 1, clerk in factor 2); and (2) these clusters were not consistent across different solutions. What is most striking about the creativity, people-oriented, and spatial relations aptitude job groupings is that while somewhat similar to Holland's artistic, social, and realistic

stereotypes, the way in which they cluster indicates that they seem to represent Ss' perceptions about the nature of the type of work performed, rather than the type of personality involved. With this in mind, it is somewhat puzzling why the people-oriented cluster did not include teacher and social worker.

CONCLUSIONS

The results obtained in this study are not at all conclusive. They may simply be a manifestation of (1) the relatively homogeneous subject population, which would be considered "social" under Holland's model; and (2) the sample of JTs presented. It is quite possible that a different group of JTs for each stereotype might have resulted in other job clusters. It would certainly have been more desirable to provide a greater number of JTs for each stereotype, although the $\frac{n(n-1)}{2}$ pairs would require an excessive amount of time for each S. The most important finding obtained from this analysis is that people appear to view job similarity based on the nature of the work performed, rather than on the basis of personality.

The apparent goodness of fit and interpretability of the data indicate that nonmetric multidimensional scaling is a useful technique for evaluating individuals' perceptions of the world of work. Replications of this study are encouraged with other subject populations and JT samples to validate the results obtained herein.

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Table 1

Personality Stereotypes and Selected Job Titles

I. Realistic	IV. Conventional
1. Mechanic	10. Accountant
2. Policeman	11. Clerk
3. Engineer	12. Bank Teller
II. Intellectual	V. Enterprising
4. Mathematician	13. Lawyer
5. Dentist	14. Salesman
6. Philosopher	15. Business Executive
III. Social	VI. Artistic
7. Teacher	16. Writer
8. Nurse	17. Artist
9. Social Worker	18. Musician

Figure 1

Stress by Dimensionality

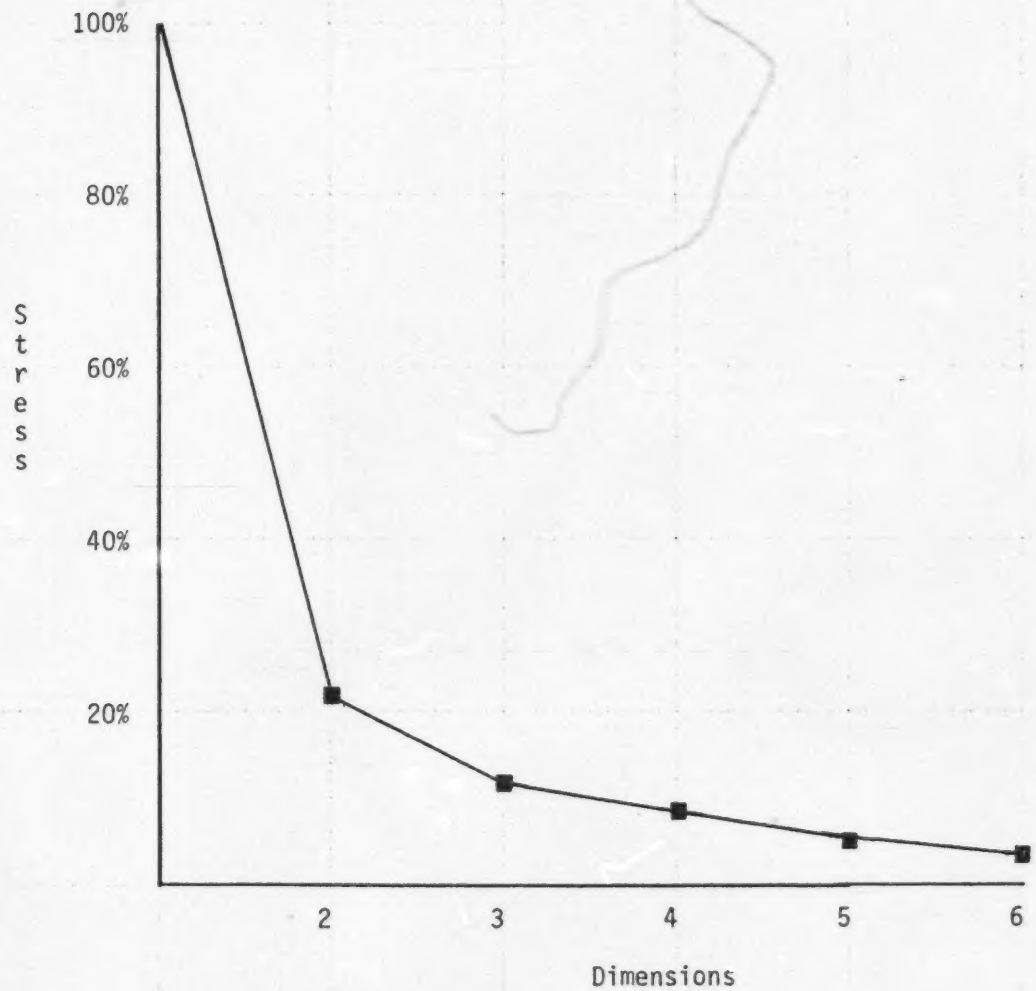

Table 2

Structure Matrix for 2-Dimensional Solution

Job Title	Factor 1	Factor 2
Mechanic	.51	.09
Policeman	.24	.36
Engineer	.13	.05
Mathematician	.08	-.16
Dentist	.08	.48
Philosopher	-.40	.08
Teacher	-.20	.05
Nurse	.02	.42
Social Worker	-.16	.26
Accountant	.18	-.22
Clerk	.20	-.37
Bank Teller	.39	-.29
Lawyer	-.01	.15
Salesman	.03	-.38
Business Executive	.23	-.10
Writer	-.41	-.10
Artist	-.45	-.10
Musician	-.47	-.22

Table 3

Structure Matrix for 3-Dimensional Solution

Job Title	Factor 1	2	3
Mechanic	.27	.06	.69
Policeman	.17	.47	-.46
Engineer	.06	-.01	.42
Mathematician	.19	-.24	.28
Dentist	.15	.55	.36
Philosopher	-.58	.06	-.16
Teacher	-.27	.10	-.03
Nurse	.04	.61	.08
Social Worker	-.17	.36	-.28
Accountant	.37	-.31	.02
Clerk	.27	-.49	-.20
Bank Teller	.62	-.38	-.04
Lawyer	.12	.22	-.32
Salesman	.17	-.31	-.39
Business Executive	.39	-.02	-.18
Writer	-.57	-.21	-.14
Artist	-.61	-.13	.17
Musician	-.64	-.33	.17

Table 4

Structure Matrix for 4-Dimensional Solution

Job Title	Factor 1	2	3	4
Mechanic	.30	.04	.65	-.29
Policeman	.24	.48	-.48	-.14
Engineer	.06	.03	.46	.16
Mathematician	.15	-.26	.28	.29
Dentist	.14	.59	.37	.17
Philosopher	-.61	.09	-.19	.14
Teacher	-.28	.14	-.07	-.19
Nurse	.11	.61	.08	-.19
Social Worker	-.13	.35	-.29	-.24
Accountant	.37	-.32	.01	.20
Clerk	.33	-.51	-.16	-.11
Bank Teller	.67	-.30	-.06	-.17
Lawyer	-.00	.15	-.22	.44
Salesman	.18	-.32	-.38	-.24
Business Executive	.34	-.07	-.22	.33
Writer	-.60	-.22	-.15	.16
Artist	-.65	-.17	.20	-.05
Musician	-.64	-.32	.15	-.27